

SR-23

NEW HAVEN DUMP SITE SEABED AND SURFACE DRIFTER STUDY

by

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Introduction: A research project to study oceanographic factors relating to disposal of dredged material in Long Island Sound was initiated in July, 1972. The primary purpose was to study conditions in a given area before, during and after dumping; the area is located 5 miles south of New Haven Harbor, Connecticut.

This portion of the investigation is concerned with the long term bottom and surface water movements in and around the area as evidenced by surface and seabed drifters (see Fig. 1). The other data of the study is to be submitted separately.

The objectives of this portion of the study are to determine where fine-grained dredged material may possibly drift by observing: (1) bottom water movement using seabed drifters; and (2) surface water movement using surface drifters. This should give a good estimate of the movement in the entire water column.

It must be emphasized that the surface drifters, which are slightly positively buoyant, and the seabed drifters which are slightly negatively buoyant, represent the most adverse conditions and do not indicate that there will be a heavy influx of dredged material where they were recovered. They do indicate, however, that soluble materials and easily suspended materials could be deposited near the locations where the drifters were recovered.

Area of Study

The area of study is located south of New Haven, Conn. between latitudes $41^{\circ}15'N$ to $41^{\circ}03'N$ and longitudes $72^{\circ}41'W$ to $73^{\circ}03'W$. This area comprises the New Haven dump site and surrounding areas. The water depths in the area vary from 34 ft to greater than 130 ft.

Methods of Study

A. Field Methods

Seabed drifters and surface drifters were released at twenty-four stations south of the Connecticut shoreline in Long Island Sound on 15 March 1973 (Fig. 1). The type of drifter used is shown in Fig. 2.

The seabed drifters consist of a mushroom or umbrella shaped disc with a long (about 55 cm) stem of plastic at ninety degrees to the disc. The stem is weighted near the bottom such that the disc is slightly negatively buoyant and floats with the stem just touching the bottom. Each disc has a different number stamped on its surface as well as a legend stating "50¢ reward on return of serial number with date found, location, your name and address to the Univ. of Conn. Marine Sciences Institute, Groton, Ct. 06340 USA".

The seabed drifters used in this study were released in clumps of 5 at each station. The seabed drifters were tied together with an elastic band passed through a salt disc called a "Bunny Lik". Before using the Bunny Liks

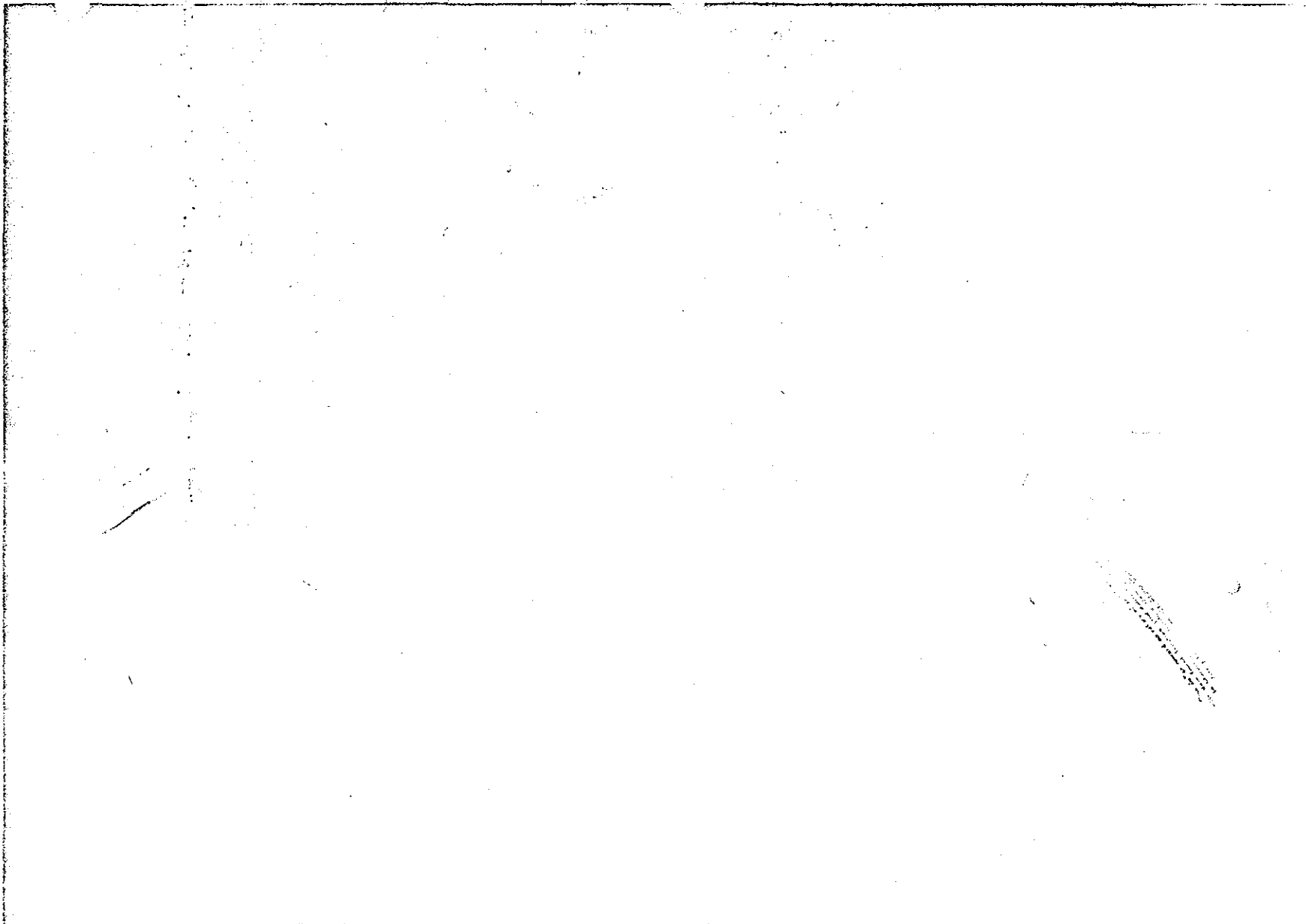


FIGURE 2
Drifters

the center hole was enlarged to one half inch to facilitate fabrication of the clumps. The clumps sink to the bottom and the drifters separate when the salt lick dissolves (45 minutes in a static test).

Results

Seabed drifters and surface drifters were released at 24 stations (1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,23,24,25,26,27 and 28) on 15 March 1973 (Fig. 1). Forty-two seabed drifters were recovered from the one hundred twenty released. This represents a thirty-five (35%) percent return of total seabed drifters released. At least one drifter was recovered from each station, with the exceptions of 3 and 10; this represents a station return of 91.7%.

The seabed drifter releases and returns are summed in Table 1. All but three of the returns were from the south shore of Connecticut; such returns being from as far east as Madison and as far west as Stratford. Most of the Connecticut returns were in the Milford, New Haven and Guilford areas. One of the drifters was picked up by an oyster dragger just behind the eastern New Haven Harbor breakwater.

The three seabed drifters recovered on the North shore of Long Island were from Stations 7,17 and 23. All of these stations have at least one return from the south shore of Connecticut. The return of a seabed drifter re-

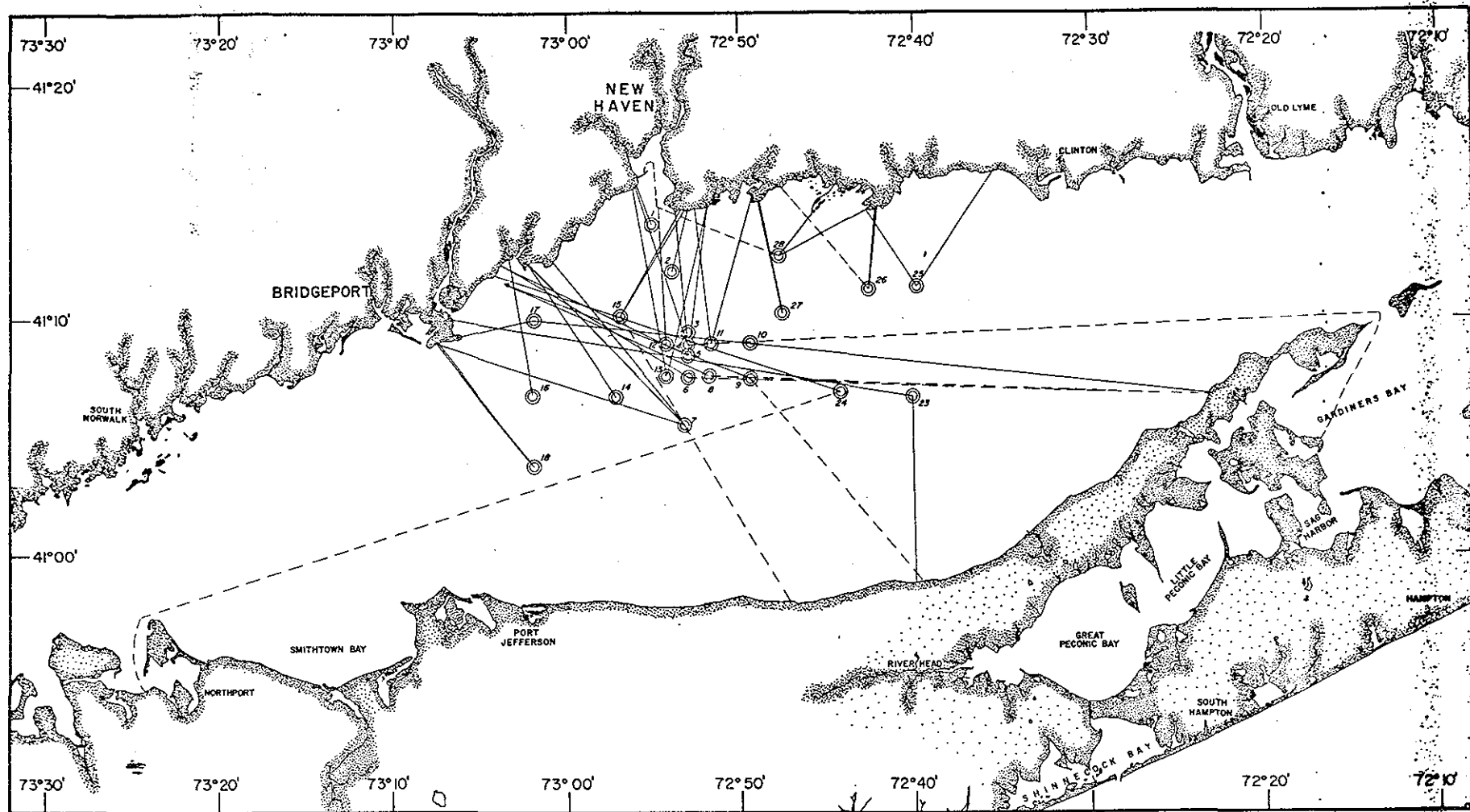


FIGURE 1
Location Map

leased from Station 17 from Greenport, N.Y. seems to indicate that this drifter had to go through or around an area where all the other drifters went to the Connecticut shore. The drifters that went to the Long Island shore were found much later than most of the others (see Table 1A). Current measurements at the Race (Paskausky,* et al. 1972) indicate an cyclonic (counterclockwise) net transport gyre in the eastern portion of Long Island Sound. With the diminished Connecticut River flow in June and July this gyre may have penetrated as far as the New Haven area in early July and caused the anomalous returns. The drifter from Station 7 was recovered on 2 January 1974 just after several large storms; 3 other drifters from this station were recovered from the Connecticut shore but much earlier.

Relative to the recovery area versus the release stations, it must be pointed out that no drifters from the chosen dump site were recovered from the Long Island Shore. All dump site drifter recoveries were found on the south shore of Connecticut.

*Paskausky, D.F., A.J. Nalwalk and D. Murphy. Generation of a Cyclonic Circulation Gyre by two-layered flow in the Eastern Passages of Long Island Sound. (abstract). EOS Trans. AGU 53(11), Nov., p. 1019.

Seabed drifter studies to date indicate that some material released between stations 4 and 12 would come back into the New Haven Harbor area if it was suspended and carried by bottom currents.

Eight surface drifters were recovered from 24 released. This represents a 33% return of total surface drifters released and since there was one drifter per station a 33% station return.

The surface drifter releases and returns are summed in Table 2. Six of the surface drifters recovered were found on the north shore of Long Island from as far east as Gardiners Bay and as far west as Northport, N.Y. The two found on the south shore of Connecticut went northwest from stations 26 and 28. The only surface drifter from the dump site (Station 4) that was recovered was found in Gardiners Bay on Ram Island. All of the other recovered surface drifters were from stations outside the dump site. This may indicate that surface water moves out of Long Island Sound in the eastern half.

RECOMMENDATION

On the basis of the seabed drifter returns, it is suggested that a mineralogical tracer be released at the dump site, and the beaches where drifters were recovered be monitored for the mineralogical tracers.

APPENDIX A

This section contains data related to the recovery of seabed and surface drifters released on March 15, 1973 from Stations 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18, 23,24,25,26,27 and 28.

No drifters were released from Stations 19,20,21 and 22 because of time. Drifters were released in the area south of Stations 18,7,24 and 23 (see Figure 1) by helicopter and will be reported on at a later date.

TABLE 1

Number of Seabed Drifters Recovered From Each Station
(Released in Clumps of 5)

<u>STATION NUMBER</u>	<u>DRIFTERS RECOVERED</u>	<u>WHERE RECOVERED</u>	<u>STATION NUMBER</u>	<u>DRIFTERS RECOVERED</u>	<u>WHERE RECOVERED</u>
1	2	C,L	15	3	C,C,C
2	1	C	16	1	C
3	0		17	2	C,L
4	2	C,C	18	2	C,C
5	2	C,C	19	none	dropped
6	1	C	20	none	dropped
7	4	C,C,C,C	21	none	dropped
8	1	C	22	none	dropped
9	1	C	23	2	L,C
10	0		24	1	C
11	2	C,C	25	2	C,C
12	1	C	26	2	C,C
13	2	C,C	27	2	C,C
14	1	C	28	2	C,C

C = Recovered from Connecticut shore

L = Recovered from Long Island shore

TABLE 1A

Seabed Drifter Recovery Data
(All Released on 15 March 1973)

<u>STATION RELEASED FROM</u>	<u>NUMBER OF DRIFTER</u>	<u>WHERE RECOVERED FROM</u>	<u>DATE</u>
1	000101 000102	West Haven, Conn. Calverton, L.I.	4/14/73 12/24/73
2	000105	East Haven, Conn.	3/27/73
3	NO RETURNS		
4	000163 000160	West Haven, Conn. East Haven, Conn.	4/05/73 6/05/73
5	000155 000157	East Haven, Conn. Milford, Conn.	4/10/73 4/12/73
6	000147	Milford, Conn.	4/10/73
7	000154 000152 000151	Milford, Conn. Stratford, Conn. Milford, Conn.	3/28/73 4/08/73 4/20/73
8	000178	Milford, Conn.	4/12/73
9	000184 *000182	Charles Island, Ct. Stratford, Conn.	4/29/73 11/22/73
10	NO RETURNS		
11	000172 000170	East Haven, Conn. Bran ord, Conn.	3/27/73 5/01/73
12	000136	Back/N.H.H. Brkwt (recovered/dragger)	4/03/73
13	000140 000142	East Haven, Conn. West Haven, Conn.	5/18/73 9/19/73
14	000127	Milford, Conn.	4/05/73
15	000130 000132 000134	East Haven, Conn. East Haven, Conn. East Haven, Conn.	3/26/73 3/24/73 3/24/73

TABLE 2

Number of Surface Drifters Recovered From Each Station
(Released Individually)

<u>STATION NUMBER</u>	<u>DRIFTERS RECOVERED</u>	<u>WHERE RECOVERED</u>	<u>STATION NUMBER</u>	<u>DRIFTERS RECOVERED</u>	<u>WHERE RECOVERED</u>
1	0		15	1	L
2	0		16	0	
3	0		17	0	
4	1	L	18	0	
5	0		19	none dropped	
6	1	L	20	none dropped	
7	0		21	none dropped	
8	1	L	22	none dropped	
9	1	L	23	0	
10	0		24	1	L
11	0		25	0	
12	0		26	1	C
13	0		27	0	
14	0		28	1	C

C = Recovered from Connecticut shore

L = Recovered from Long Island shore

<u>STATION RELEASED FROM</u>	<u>NUMBER OF DRIFTER</u>	<u>WHERE RECOVERED FROM</u>	<u>DATE</u>
16	000118	Milford, Conn.	5/27/73
17	000113	Stratford, Conn.	6/05/73
	000112	Greenport, N.Y.	7/18/73
18	000121	Stratford, Conn.	4/21/73
	000121	Stratford, Conn.	4/27/73
	*000120	Stratford, Conn.	12/14/73
	*000124	Stratford, Conn.	12/10/73
23	000199	Riverhead, N.Y.	7/18/73
	000195	Stratford, Conn.	9/09/73
24	000190	Milford, Conn.	4/29/73
25	000202	Madison, Conn.	4/10/73
	000204	Guilford, Conn.	6/26/73
26	000207	Guilford, Conn.	3/28/73
	000205	Guilford, Conn.	4/06/73
27	000212	Branford, Conn.	4/20/73
	000210	Branford, Conn.	4/06/73
28	000218	Stony Creek, Conn.	4/08/73
	000219	Guilford, Conn.	4/11/73

* Indicates seabed drifter data returned after figure 1 was compiled

TABLE 2A

Surface Drifter Recovery Data
(All Released on 15 March 1973)

<u>STATION RELEASED FROM</u>	<u>NUMBER OF DRIFTER</u>	<u>WHERE RECOVERED FROM</u>	<u>DATE</u>
1	NO RETURNS		
2	NO RETURNS		
3	NO RETURNS		
4	000262	Shelter Island, N.Y.	5/17/73
5	NO RETURNS		
6	000259	Greenport, N.Y. (northshore)	3/21/73
7	NO RETURNS		
8	000265	Greenport, N.Y. (northshore)	3/21/73
9	000266	Riverhead, L.I., N.Y.	4/05/73
10	NO RETURNS		
11	NO RETURNS		
12	NO RETURNS		
13	NO RETURNS		
14	NO RETURNS		
15	000256	Wildwood, N.Y.	No date
16	NO RETURNS		
17	NO RETURNS		
18	NO RETURNS		
23	NO RETURNS		

2A

<u>STATION RELEASED FROM</u>	<u>NUMBER OF DRIFTER</u>	<u>WHERE RECOVERED FROM</u>	<u>DATE</u>
24	000268	Hunting, N.Y.	4/05/73
25	NO RETURNS		
26	000270	Branford, Conn.	3/29/73
27	NO RETURNS		
28	000273	New Haven Harbor, Ct.	3/26/73